

Remote, Redesigned Air Bag Special Study
FOR NHTSA'S INTERNAL USE ONLY
Dynamic Science, Inc., Case Number (1999-75-801E)
1998 Saturn SC2
Colorado
May/1999

Technical Report Documentation Page

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16. Abstract This remote investigation focused on the redesigned air bag system deployment of a 1998 Saturn SC2 two-door sedan. This moderate injury crash occurred in May, 1999 in the early morning. The weather was clear and the bituminous roadways were dry. The crash occurred in a four-legged intersection. The northbound roadway is a straight two-way divided roadway and is comprised of three northbound travel lanes, a grass covered center median, and two southbound lanes. The southbound roadway is a straight two-way undivided roadway and is comprised of two southbound lanes, two northbound lanes, and a center turn lane. The intersection is controlled by overhead traffic signals; the lights were green for northbound and southbound traffic. The asphalt road is level at the area of impact.			
Vehicle 1, a 1996 Chevrolet Blazer utility vehicle driven by a 16-year-old male, was originally traveling southbound in the left hand turn lane. Vehicle 2, a 1998 Saturn SC2 driven by a restrained 37-year-old female (165 cm/65 in., 59 kg/130 lbs), was traveling northbound in the second lane from the right at an unknown speed approaching the intersection. The front right seat was occupied by a restrained 14-year-old female (152 cm/59.8 in, 48 kg/106 lbs). The rear right seat was occupied by a restrained 14-year-old female (156 cm/61 in., 45 kg/99 lbs.).			
The driver of Vehicle 1 failed to see Vehicle 2 approaching and initiated the left turn in the path of the oncoming vehicle. Vehicle 2 did not take an avoidance actions. The front plane of Vehicle 2 (11FYEW2) struck the right side of Vehicle 1 in the intersection. Both vehicles came to rest in the intersection.			
A Delta V was calculated for Vehicle 2, utilizing the Damage Only Algorithm of WinSMASH, as 31.4 km/h (19.5 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed.			
The driver of Vehicle 1 did not report any injuries. All three occupants of Vehicle 2 sustained minor injuries and were transported from the scene for treatment.			
Vehicle 1 was driven from the scene; Vehicle 2 was disabled due to damage sustained in the crash and was towed from the scene.			
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Summary

This remote investigation focused on the redesigned air bag system deployment of a 1998 Saturn SC2 two-door sedan. This moderate injury crash occurred in May, 1999 in the early morning. The weather was clear and the bituminous roadways were dry. The crash occurred in a four-legged intersection. The northbound roadway is a straight two-way divided roadway and is comprised of three northbound travel lanes, a grass covered center median, and two southbound lanes. The southbound roadway is a straight two-way undivided roadway and is comprised of two southbound lanes, two northbound lanes, and a left hand turn lane. The intersection is controlled by overhead traffic signals; the lights were green for northbound and southbound traffic. The asphalt road is level at the area of impact.

Vehicle 1, a 1996 Chevrolet Blazer utility vehicle driven by a 16-year-old male, was originally traveling southbound in the left hand turn lane. Vehicle 2, a 1998 Saturn SC2 driven by a restrained 37-year-old female (165 cm/65 in., 59 kg/130 lbs), was traveling northbound in the second lane from the right at an unknown speed approaching the intersection. The front right seat was occupied by a restrained 14-year-old female (152 cm/59.8 in, 48 kg/106 lbs). The rear right seat was occupied by a restrained 14-year-old female (156 cm/61 in., 45 kg/99 lbs.).

Crash Events

The driver of Vehicle 1 failed to see Vehicle 2 approaching and initiated the left turn in the path of the oncoming vehicle. Vehicle 2 did not take an avoidance actions. The front plane of Vehicle 2 (11FYEW2) struck the right side of Vehicle 1 in the intersection. Both vehicles came to rest in the intersection.

A Delta V was calculated for Vehicle 2, utilizing the Damage Only Algorithm of WinSMASH, as 31.4 km/h (19.5 mph). As a result of the frontal impact, the supplemental restraint system (driver's and passenger's frontal redesigned air bags) of the case vehicle deployed.



Figure 1. Exterior, Vehicle 2 (Saturn SC2)

The driver of Vehicle 1 did not report any injuries. All three occupants of Vehicle 2 sustained minor injuries and were transported from the scene for treatment.

Vehicle 1 was driven from the scene; Vehicle 2 was disabled due to damage sustained in the crash and was towed from the scene.

Table 1. Delta V

	Case Vehicle (V2)		Other Vehicle (V1)	
	km/h	mph	km/h	mph
Total	31.4	19.5	21.5	13.4
Longitudinal	-30.3	-18.8	-17.6	-10.9
Lateral	8.1	5	-12.4	-7.7

Exterior of Case Vehicle

Table 2. Vehicle Information

Model year, make and model	1998 Saturn SC2
VIN	1G8ZG1279WZxxxxxx
CDC	11FYEW2



Figure 2. Left front corner view of case vehicle



Figure 3. Front of case vehicle

Table 3. Crush Measurements

Plane of Impact	Field L cm/in.	C1 cm/in.	C2 cm/in.	C3 cm/in.	C4 cm/in.	C5 cm/in.	C6 cm/in.
Bumper	128	21	43	38	28	21	4
	50.4	8.3	16.9	15	11	8.3	1.6

Interior of Case Vehicle

The interior of the Saturn SC2 sustained minor contact damage from occupant contact; a scuff was found below the left instrument panel and the right side seat back was deformed. There were no areas of intrusion into the passenger compartment..

The case vehicle was equipped with bucket seats with adjustable head restraints in the front left and front right seating positions. The front left seat was adjusted to the rear most track position; the front right seat was adjusted to the forward most seat position. The rear of the vehicle was equipped with split bench seats with folding backs with no head restraints in all three seating positions.



Figure 4. Driver's seated position

Case Vehicle Occupant Protection Systems

The Saturn SC2 was equipped with a redesigned air bag system which consisted of front left and front right air bag modules which housed air bags and depowered inflator units. The front left air bag was housed in the steering wheel hub and was concealed by I-configuration cover flaps that were not damaged. The circular air bag was equipped with three tethers and two vent ports. No contact evidence was found on the air bag and the air bag was not damaged. The front right air bag was housed in the mid instrument panel. The air bag did not come equipped with either vent holes or tethers. Neither the air bag nor the module covers were damaged.



Figure 5. Deployed driver's frontal air bag



Figure 6. Driver's frontal air bag module cover



Figure 7. Deployed passenger's frontal air bag

Case Vehicle Occupant Demographics

	Occupant 1		Occupant 2		Occupant 3	
Age/Sex:	37/Female		14/Female		14/Female	
Seated Position:	Front left		Front right		Rear right	
Seat Type:	Bucket with folding back. Seat at rear most track position.		Bucket with folding back. Seat at forward most seat track position.		Split bench with folding back. Not adjustable seat track.	
Height (cm/in):	165	65	152	59.8	156	61
Weight (kg/lbs):	59	130	48	106	45	99
Pre-existing Medical Condition:	None noted		None noted		None noted	
Body Posture:	Normal, upright		Normal, upright		Normal, upright	
Hand Position:	Both hands on steering wheel (2 and 9 o'clock positions)		Unknown		Holding a book	
Foot Position:	Right presumed to be on accelerator, left on floor		Both on floor		Both on floor	
Restraint Usage:	Lap and shoulder belt used properly		Lap and shoulder belt used properly		Lap and shoulder belt used properly	
Air bag:	Air bag deployed		Air bag deployed		NA	

Occupant Injuries

Table 4. Injuries (Occupant #1)

Injury	Injury Severity (AIS)	Injury Mechanism
Right knee contusion	1	Left lower instrument panel / knee bolster
Right forearm contusion	1	Air bag

Table 5. Injuries (Occupant #2)

Injury	Injury Severity (AIS)	Injury Mechanism
Right wrist strain	1	Air bag
Right inner forearm contusion	1	Air bag
Right outer forearm contusion	1	Air bag
Forehead, abrasion	1	Air bag

Table 6. Injuries (Occupant #3)

Injury	Injury Severity (AIS)	Injury Mechanism
Contusion, left hip	1	Seat belt

Occupant Kinematics

The front left occupant of the case vehicle was seated in an upright, normal fashion. She was wearing the available lap and shoulder belts. The seat was adjusted to the full back position. The tilt steering column was adjusted to the center position. The front right occupant of the case vehicle was seated in an upright, normal fashion. She was wearing the available lap and shoulder belts. The seat was adjusted to the fully forward position. The rear right occupant was seated in an upright, normal fashion. She was wearing the available lap and shoulder belt.

At impact, the front left occupant reacted to the 340E direction of principal force by moving forward and to the left. Her right forearm came into contact with the deploying air bag and sustained a contusion. Her right knee came forward and engaged the lower instrument panel, causing a minor contusion. At impact, the front right occupant reacted to the 340E direction of principal force by moving forward and to the left. As the air bag deployed, it struck the inside of her right forearm, causing a contusion. As the air bag continued to deploy, it pushed her arm laterally into the side door, causing a contusion to the outer portion of her forearm. As this occupant pitched forward, she engaged the deploying air bag with her forehead, causing a minor abrasion near the hair line. At impact, the rear right occupant reacted to the 340E direction of principal force by moving forward and to the left. As this occupant pitched forward, she was locked into place by the lap and shoulder belt. This movement caused the occupant to load the lap portion of the belt which caused a contusion to her left hip. There was a contact mark to the rear of the front right seat, but no associated injury.



Figure 8. Contact mark to left instrument panel area



Figure 9. Rear of front right seat

Scene Diagram

